



## TECHNICAL BULLETIN

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# The Apple II High-Speed SCSI Card

Apple has just introduced the Apple® II High-Speed SCSI Card, which brings full SCSI peripheral device compatibility and the speed of true DMA (direct memory access) transfers to the Apple II family of personal computers. The card, which replaces the existing Apple II SCSI Card, provides several advantages to Apple II users:

- Faster data transfer using DMA
- Access to any SCSI device through the Generic SCSI call
- Direct firmware and/or operating system support for many of the currently available Apple SCSI devices

data at rates of up to 1 byte every microsecond, or 1 megabyte of data per second.

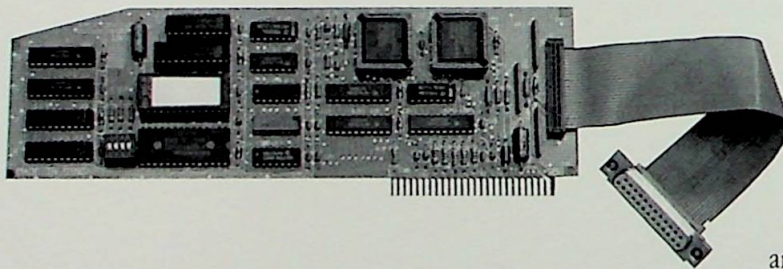
The Apple II High-Speed SCSI Card has a special compatibility mode, controlled by a DIP switch setting, for use with DMA cards that might take permanent control of the DMA line, keeping the SCSI card from doing useful work. The compatibility mode operates as follows.

During a DMA transfer, a card asserts the computer's DMA signal. This puts the computer's microprocessor to "sleep," allowing the DMA card to take control of the address and data buses. The DMA card then reads/writes a byte of data from/to memory, and then releases the DMA signal and the address and data buses when the transfer is complete. The computer's microprocessor then wakes up and

continues, unaware that it was stopped momentarily.

Some DMA cards, however, take permanent control of the DMA line (such as some accelerator cards) or take control unpredictably (that is, not under software control, such as some video frame grabber cards). This prevents any other card in the system from doing DMA, since only one card at a time can use DMA. While the SCSI

card is designed to use DMA for maximum speed, it has the ability to do data transfers without using DMA, by disabling DMA and transferring bytes under software control. This allows it to coexist with cards like accelerators and frame grabbers. To disable DMA, the user sets the DMA Disable DIP switch on the SCSI card. The firmware in the SCSI card's ROM will sense this switch setting and not use



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## Direct Memory Access

The new Apple II High-Speed SCSI Card supports true DMA data transfer. During a DMA transfer, the SCSI card takes control of the system and transfers



DMA. Disabling DMA causes the card speed to decrease to a rate similar to that of the existing card.

*Note:* The SCSI card performs DMA at half speed when it is installed in an Apple IIe. This is a requirement of the computer's 65C02 microprocessor. Installed on the Apple IIGS®, the card runs at full speed.

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### The Generic SCSI Call

The Apple II High-Speed SCSI Card comes with an assortment of commands built into its firmware to handle a variety of peripheral devices, but the card does not restrict you to just those commands. Rather, by using the Generic SCSI call, you can issue all other present SCSI commands, as well as those that will be available in the future.

The High-Speed SCSI Card has the ability to pass SCSI commands to any type of SCSI device, and it permits SCSI devices to be attached to the Apple II even though the firmware on the SCSI card is not cognizant of these commands. The High-Speed SCSI Card thus provides another level of device independence between the Apple II and the Macintosh® computer. Any SCSI device that works on the Macintosh can work with the new card. All it needs is an appropriate driver (such as for a hard disk, CD-ROM drive, tape drive, scanner, or printer) and software.

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### Other Data Transfer Speedups

The new SCSI card firmware provides faster data transfer even when DMA is not in use. For example, AppleWorks® GS loads into the computer faster than was previously possible. A similar speed improvement occurs in booting the Apple II GS/OS®

operating system. Although the ProDOS® 8 operating software does not boot any faster than before, booting now adheres to the SCSI standard.

The GS/OS SCSI driver has been rewritten to work with the new card, and now makes DMA or pseudo-DMA calls as often as possible. The new driver also works with the earlier Apple II SCSI Card and provides a moderate speed improvement with that card.

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### Device Support

The High-Speed SCSI Card provides both audio and data commands for the AppleCD SC® drive. Apple is also providing users with drivers for hard disks and CD-ROM drives; these are included with the utilities. (A sample driver skeleton is available to developers that can be used to create other specific drivers.)

In addition, ProDOS 8 utility programs are also being released with the new card. These include partition and verify programs for SCSI hard disks, as well as Version 2.0 of Backup II. Version 2.0 handles extended GS/OS files with resource forks. It allows you to back up either an entire path or modified files only (that is, do an incremental backup). You can also restore either the entire device or specified files only, depending on the method selected for backup.

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### The User's Perspective

As noted earlier, the card replaces the existing Apple II SCSI Card. The new card resembles the old card physically, and installation is the same. It uses a CMOS version of the NCR 5380 SCSI interface chip. Like the existing card, it has 8 kilobytes of RAM, but has 32 kilobytes of ROM, compared with 16 kilobytes on the existing card.



Users who are familiar with the existing card will notice a significant increase in the speed of operation and won't need to modify any software (except for replacing the GS/OS SCSI drivers with the new versions).

Apple expects developers will make use of the new SCSI card to provide more devices, faster applications, and additional drivers to support existing devices.

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### System Requirements

To use the Apple II High-Speed SCSI Card, you'll need:

- An Apple IIgs personal computer or
- An Apple IIe personal computer with a 65C02 microprocessor (This includes all Apple IIe systems manufactured in 1986 or later, as well as any earlier models that have been enhanced with the Apple IIe Enhancement Kit. If you have an early model Apple IIe that has not been enhanced, you can contact your dealer to obtain the enhancement kit.)
- A 3.5-inch disk drive (Apple IIgs or Apple IIe) or a 5.25-inch disk drive (Apple IIe)
- A device with SCSI port, appropriate SCSI cabling, and one SCSI terminator

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### Ordering Information

To order the Apple II High-Speed SCSI Card (Order No. A0220LL/A), contact an authorized Apple reseller or your Apple representative. With your order, you'll receive:

- Apple II High-Speed SCSI Card
- One 3.5-inch disk with utilities and device drivers (for the Apple IIgs and Apple IIe)
- One 5.25-inch disk with utilities (for the Apple IIe)
- *Apple II High-Speed SCSI Card Owner's Guide*
- Limited warranty statement





# California Model Technology Schools: Cupertino

Since 1987, the state of California has funded select school districts for a Model Technology Schools (MTS) program. Among the six MTS sites, there is diversity in student ethnicity, school organization, instructional strategies and emphasis, and type and configuration of technology. The idea is to offer the opportunity for a variety of research studies that will help decision makers at the local and state levels. At some later date, the schools may serve as demonstration and training sites that educators can visit and, based on their observations, adopt or adapt the components of the projects to meet the needs of their own schools.

Harvey Barnett, Cupertino/Fremont District Director of Technology for the Model Technology School projects, talks about the connection of the district office to the schools on one network: "Connecting the district office not only to the principal's office but to the teachers makes it easier to communicate effectively with the teachers, to share information among teachers in different schools, and to store curriculum materials centrally."

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## The Network System

The Cupertino School District has 18 elementary and 4 junior high schools. The district has connected all of the schools via Apple Macintosh computers on a local area network (LAN) linked to a PRIME mini-computer in the central district office. The PRIME computer connects to the LAN via leased telephone lines.

The first school to be fully networked is Garden Gate Elementary, where Apple IIGs and Macintosh computers are used. The network serves the following three groups:

- The school administrative personnel—including their tasks related to the principal's office, administration, student records, finance, library management, electronic mail, calendar of events, and work orders.
- The teachers—meeting their need for classroom management tools, curriculum objectives, lesson plans, courseware, and teacher-to-teacher communications.
- The students—providing instructional courseware, telecommunications, databases, productivity tools, keyboarding practice, and publishing and graphics tools.

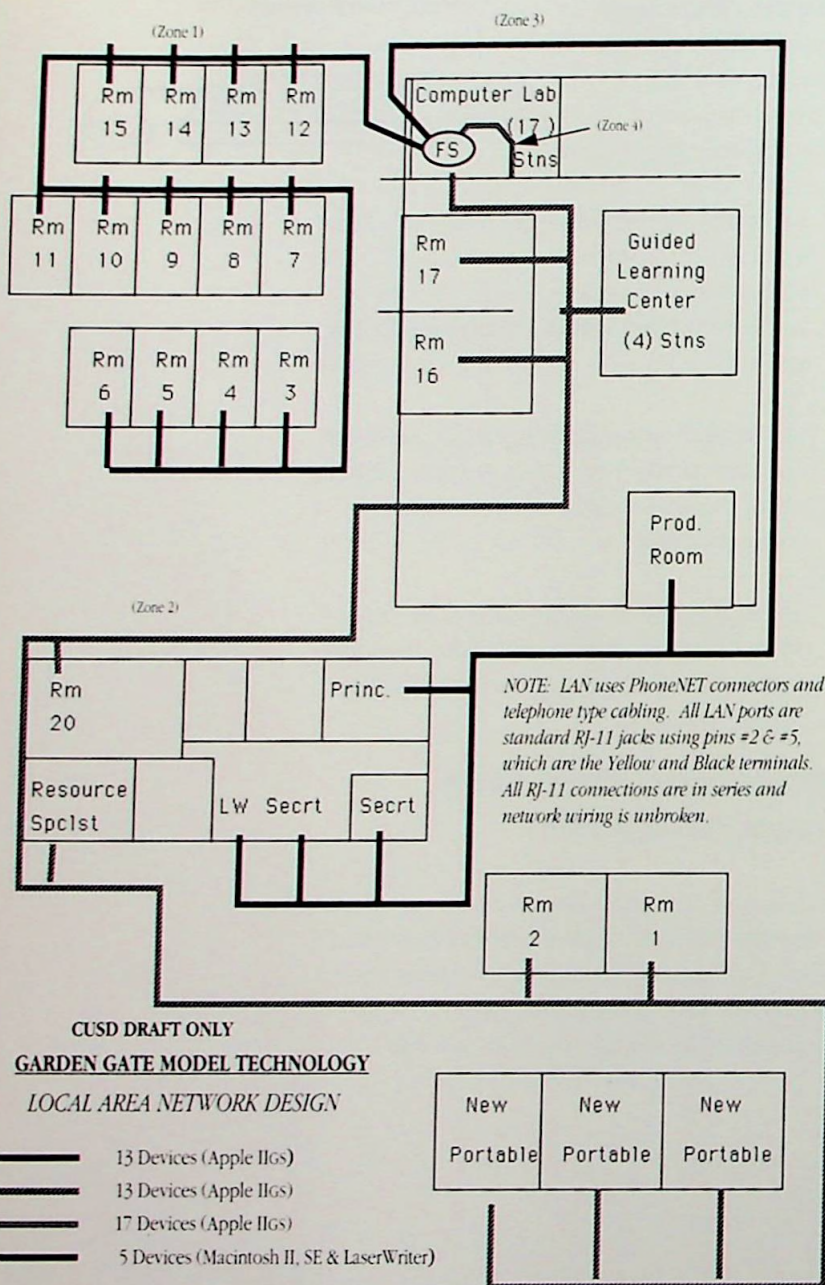
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## Computer Configuration

Each Garden Gate classroom has a fully configured teacher station, and the school shares a networked technology lab, a Guided Learning Center, a teacher productivity station, and various pieces of equipment that can be moved from room to room.







(4) zones with Macintosh II acting as the bridge using the AppleTalk Internet Router

The outline below lists the configuration of each component:

#### Apple networked lab

- Apple IIgs computers
- Macintosh II file server
- LaserWriter® printer
- Apple IIgs teacher station
- ImageWriter® printer

#### Classroom teacher stations

- Apple IIgs computers
- 26-inch color monitor
- Videocassette recorder
- ImageWriter printer

#### Guided Learning Center

- Macintosh SE for library management
- Optical scanner
- Apple IIgs computers
- ImageWriter printers
- Modem

#### Teacher productivity room

- Macintosh SE computers
- ImageWriter printers

#### Shared equipment

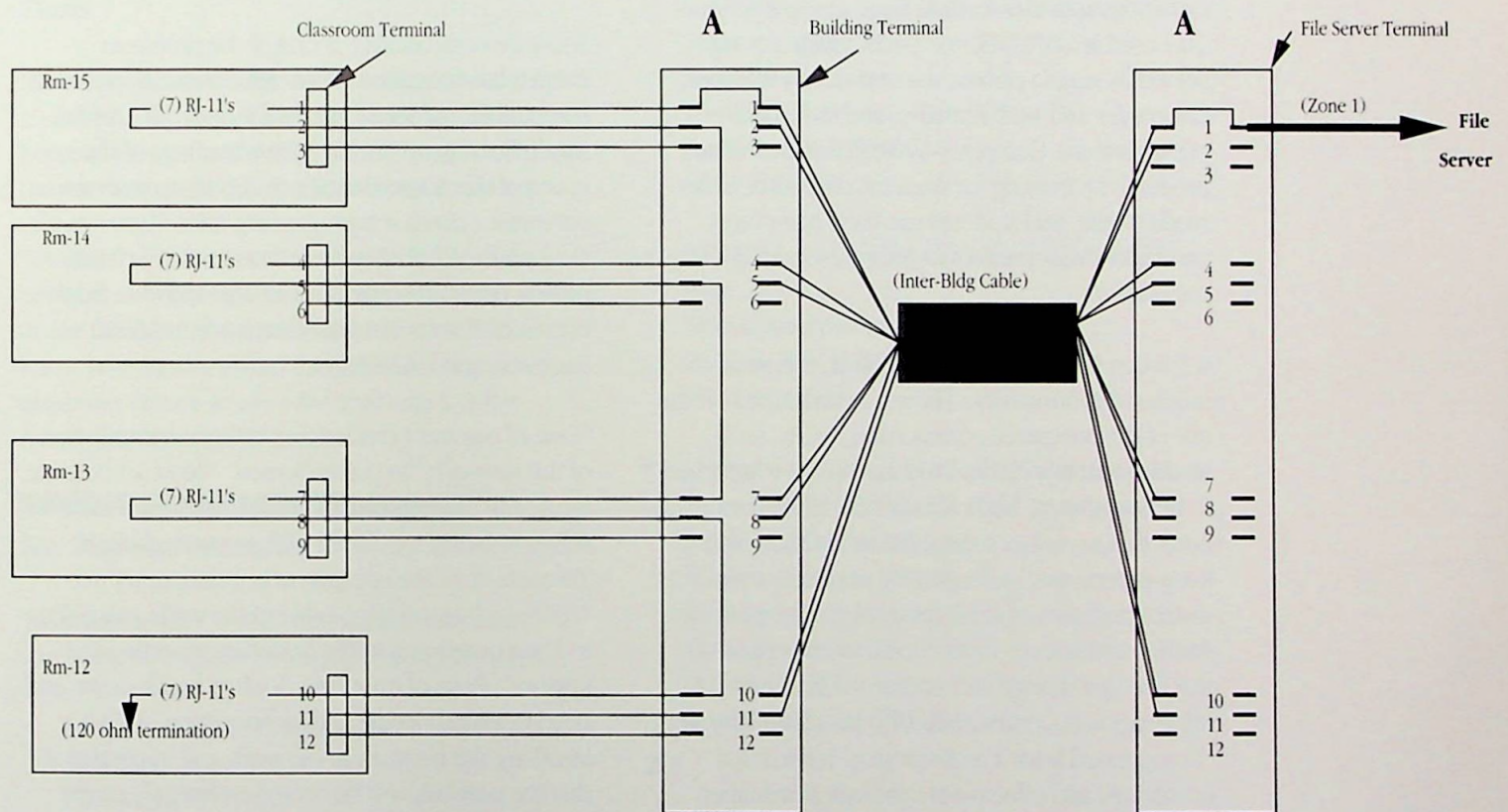
- Camcorders
- LCD panel
- Video editing machine
- Laserdisc player

Using telephone wire, Farallon PhoneNET connectors, two Taniwha Systems CommCards that give the server additional LocalTalk® ports, and an AppleTalk® Internet Router, the network runs the AppleShare® File Server software with Let's Share menu management software. All buildings and classrooms are equipped with a standard telephone cross-connect terminal for flexibility. The file server



location is the focal point of all cable runs and is therefore equipped with corresponding terminals for each interbuilding cable. Interbuilding cables are sized for two pairs per classroom; that is, four classrooms would produce eight pairs between the file server terminal and the classroom building terminal. All runs within the building consist of three pairs between the building terminal and the classroom terminal.

"We've found the backbone, or series, network configuration to be a more stable design than a passive star design, making it easier to support," explains Barnett. "We decided on telephone-type wiring to keep costs down, and one of our biggest design concerns was to provide flexibility for future expansion. Our vision is to provide five computers in each classroom, with mini-networks within each classroom or building."





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## Productivity

The goal of the Cupertino/Fremont MTS project is to assist teachers by providing them with appropriate access to technology so that they can increase their productivity and enhance their classroom delivery methods. Project teachers use their computers for word processing, grade book management, database management, spreadsheet analysis, and graphics generation. Technology-supported classroom activities include large-group hypermedia-based lessons, science lab experiments supported by macro camera-assisted demonstrations, camcorder and VCR activities, and videodisc presentations. Computer-assisted instruction and productivity training for students take place in networked labs, and students use their computers and LaserWriter printers to generate desktop publications.

A Garden Gate teacher, Janice Wild, can attest to increased productivity. Having been trained on the use of the computers, camcorders, VCRs, and instructional television, Wild has become "attached" to her computer. She's set up a computerized grade book that saves her substantial time. She's able to keep parents well-informed by providing them with instant printouts of students' grades. She puts social studies and science instructional units on disk so that she can change and update them as new information becomes available. "In short," she says, "I progressed from a technological novice to a competent and effective technological manager because of this project."

"Another strength of using an AppleShare network," says Barnett, "is the ability to load the software onto the server so that users can access applications without using floppy disks, increasing productivity for both the students and the teachers. This reduces our cost for new software and improves our disk management system. Teachers don't have to keep track of who has borrowed what software."

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## Challenges and Problems

Software compatibility is one of the problems Barnett has identified. If software is not AppleShare compatible, it doesn't run on the network. And if Apple II software doesn't take advantage of the speed of the Apple IIGS, it's necessary to reset the computer system setup—causing the software to be slow on the IIGS®. For these reasons, the school prefers buying "AppleShare aware" software from educational software providers, such as MECC, Sunburst, and GAMCO.

"One of our most challenging tasks was installation of the network," explains Barnett. "Most schools are located in older buildings, which don't lend themselves to being retrofitted with network cabling. To connect all the computers in a temporary network, we had to fasten cable to the walls and ceiling to keep pedestrian traffic from disconnecting the system." Parts of the network often break down and need troubleshooting and reconnection. "We are installing the network in the walls and in conduit so that the network will be protected from wear and tear. In the meantime, it has become obvious that we need an on-site network administrator and troubleshooter."



Another challenge comes in the area of teacher training. The success of the program depends on the teacher's ability—both technical and educational—to take advantage of it. Some of the teachers learn applications on their own initiative and encourage the children to use the computer lab. Other teachers need more assistance, and an ongoing training program is vital to the success of the project.

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### Plans

Barnett plans to expand the use of the network by connecting the school network to the students' homes. This will encourage parent involvement and student-to-student communication via computer.

"Overall," says Barnett, "I'm very proud of this network, our teachers, and the students' willingness to use the system. I think our students will have to know how to access and use information and be computer literate to meet the challenges of the twenty-first century."

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### For More Information

Following is a list of the software publishers and hardware manufacturers mentioned in this article.

- Sunburst Communications, Inc.  
39 Washington Avenue  
Pleasantville, NY 10570  
(914) 769-5030  
1-800-431-1934
- GAMCO Industries, Inc.  
P.O. Box 1911  
Big Spring, TX 79721  
1-800-351-1404
- Farallon PhoneNET  
Farallon Computing  
2201 Dwight Way  
Berkeley, CA 94704  
(415) 849-2331
- Let's Share (See "Let's Share Menu Management Software," page 20.)  
Russ Systems, Inc.  
1344 Pacific Avenue, Suite 103  
Santa Cruz, CA 95060  
(408) 476-8050
- MECC (See "MECC Products for Education," page 22.)  
3490 Lexington Avenue North  
St. Paul, MN 55112  
(612) 481-3500
- CommCard (Installs in a NuBus™ slot and adds either four RS-232/RS-422 serial ports or one extra LocalTalk port.)  
Taniwha Systems Design  
2206 Roosevelt Avenue  
Berkeley, CA 94703  
(415) 540-5557  
AppleLink®: CAMPBELL.P





# Overview: APDA

The Apple Programmers and Developers Association (APDA™) provides current technical information and advanced development tools and utilities to independent programmers and to developers of Apple computer-compatible products.

APDA is a convenient source for the most current Apple technical information and tools, with offerings relevant to professional programmers, computer enthusiasts and hobbyists, educators developing curriculum-related materials, software and systems consultants, hardware developers, or anyone who needs fast and easy access to Apple technical resources. Products include Macintosh and Apple II family development tools, system software, technical notes, manuals, third-party language and development tools, the A/UX® Device Driver Development Kit, and the Addison-Wesley technical library.

APDA members receive the *APDAlog*, a quarterly newsletter/catalog with feature articles on Apple products and developer programs, regular columns on development tools, notices about successful products, and full details on all APDA products. Regular bulletins keep you up to date between newsletters.

You can order products at the same time you join APDA; processing of your membership agreement and the accompanying order usually takes 24 hours. You can order on-line via AppleLink, CompuServe, GENie, MCI or MacNet, or by calling a toll-free phone number. You can also choose a subscription option that will provide you with new products as they become available.

Following is a list of Apple II products currently available from APDA.

## Apple Developer Tools and Languages

Apple II Desktop Toolkit Pascal Version 1.0B5  
Apple II Desktop Toolkit ProDOS Version 1.0B5  
Apple II Filecard Toolkit  
*Apple II Memory Expansion Card Reference Manual*  
Apple II Pascal Version 1.3  
Apple II Pascal Version 1.3 Device Support Tools  
Apple II SuperPILOT Plus Special Edition Version 1.0  
Apple II System Disk Version 3.1  
*Apple II Technical Notes 1985-1988* (printed version)

*Apple II Technical Notes 1985-1988* (disk version)  
*Apple II Technical Notes 1989* (printed version)  
*Apple II Technical Notes 1989* (disk version)  
Apple II Video Overlay Card Development Kit Version 1.1  
*Apple IIc Memory Expansion Card Reference Manual*  
*DOS 3.3 Programmer's Manual*  
*DOS 3.3 User's Manual*  
ProDOS Assembly Tools



## Apple IIGS Developer Tools and Languages

<i>Apple IIGS Assembler Toolbox Quick Reference</i>	APW C: Apple IIGS Programmer's Workshop C
Apple IIGS BASIC Version 1.0B4	Version 1.0.2 Update
<i>Apple IIGS C Toolbox Quick Reference</i>	APW C: Apple IIGS Programmer's Workshop C
Apple IIGS Icon Editor	Bundle Version 1.0.2 Final
Apple IIGS Source Code Sampler, Volume 1	APW: Apple IIGS Programmer's Workshop
Apple IIGS System Disk Version 3.2	Version 1.0.2
Apple IIGS System Disk Version 4.0	APW: Apple IIGS Programmer's Workshop
<i>Apple IIGS Toolbox Reference Update</i>	Version 1.0.2 Interfaces
<i>Apple IIGS X-Ref (Cross-Reference) to Apple II Programming Books</i>	APW: Apple IIGS Programmer's Workshop
APW™ C: Apple IIGS Programmer's Workshop C	Version 1.0.2 Update
Version 1.0.2	GSBug™ and Debugging Tools Version 4.0B1
APW C: Apple IIGS Programmer's Workshop C	<i>GS/OS Reference, Volume I, Beta Draft</i>
Version 1.0.2 Interfaces	<i>GS/OS Reference, Volume II, Beta Draft</i>

## MPW IIGS Developer Tools and Languages

MPW® IIGS Assembler Version 1.0 Final	MPW IIGS Pascal Bundle Version 1.0B1 (without
MPW IIGS Assembler Version 1.0 Update	MPW Version 3.0)
MPW IIGS C Version 1.0.1	MPW IIGS Pascal and C Bundle Version 1.0B1
MPW IIGS C Version 1.0.1 Interfaces	(with MPW Version 3.0)
MPW IIGS C Version 1.0.1 Update	MPW IIGS Pascal and C Bundle Version 1.0B1
MPW IIGS Pascal Version 1.0B1	(without MPW Version 3.0)
MPW IIGS Tools Version 1.0	
MPW IIGS Tools Version 1.0 Update	
MPW IIGS C Bundle Version 1.0.1 (with MPW	
Version 3.0)	
MPW IIGS C Bundle Version 1.0.1	
(without MPW Version 3.0)	
MPW IIGS Pascal Bundle Version 1.0B1	
(with MPW Version 3.0)	



## Apple Technical Library

*Apple IIc Technical Reference Manual, Second Edition*

*Apple IIe Technical Reference Manual*

*Apple IIGS Firmware Reference*

*Apple IIGS Hardware Reference*

*Apple IIGS ProDOS 16 Reference*

*Apple IIGS Toolbox Reference, Volume I*

*Apple IIGS Toolbox Reference, Volume II*

*Applesoft BASIC Programmer's Reference Manual*

*Applesoft Tutorial*

*BASIC Programming with ProDOS*

*ProDOS 8 Technical Reference Manual*

*Programmer's Introduction to the Apple IIGS*

*Technical Introduction to the Apple IIGS*

APDA

Apple Computer, Inc.

20525 Mariani Avenue, M/S 33G

Cupertino, CA 95014

1-800-282-2732 (U.S.)

800-637-0029 (Canada)

(408) 562-3910 (other countries)

TLX: 171-576

AppleLink: APDA

CompuServe: 76666,2405

MCI: Postrom

GEnie: A.DEVELOPER3

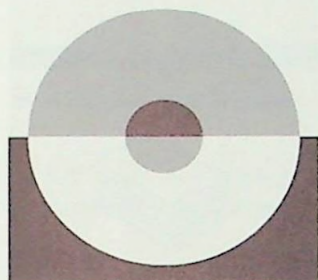
MacNet: APDA

Fax: (408) 562-3971





# Introducing the Apple Technical Information Source CD-ROM



**Technical Information Source**

The Apple Technical Information Source is a CD-ROM-based technical information retrieval product that provides a broad range of technical support tools and

information for Apple II and Macintosh systems. It's designed to help support providers—including resellers, in-house support organizations, systems integrators, and independent support contractors—furnish top-quality assistance to users of Apple computers.

The Technical Information Source provides fast, fingertip access to technical databases, frequently used system utilities and diagnostics, and a wide range of support-oriented HyperCard® stacks—all tied together with a HyperCard front end that makes it easy to navigate the 200 megabytes of information.

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## Benefits to Support Providers

The Technical Information Source collects most of the tools and information a support provider needs in a large-capacity (550MB) CD-ROM format. All the information is accessible through a single user interface—a HyperCard front end that provides fast and intuitive navigation. Because CD-ROM is a read-only medium, there is no risk of accidental erasure or infection by a computer virus.

The information will be updated regularly to keep you up to date without stacks of disks and papers. And because the Technical Information Source can be configured as an AppleShare volume, tools and

information can be shared by everyone on the network, increasing the value of your investment in the AppleCD SC drive and the Technical Information Source, and decreasing the demands on individual support providers.

The Technical Information Source will help you find answers more quickly, and you'll be less dependent on others, with answers and solutions at your fingertips. The product is designed to make you more productive in the short run, and more knowledgeable about Apple solutions in the long run.

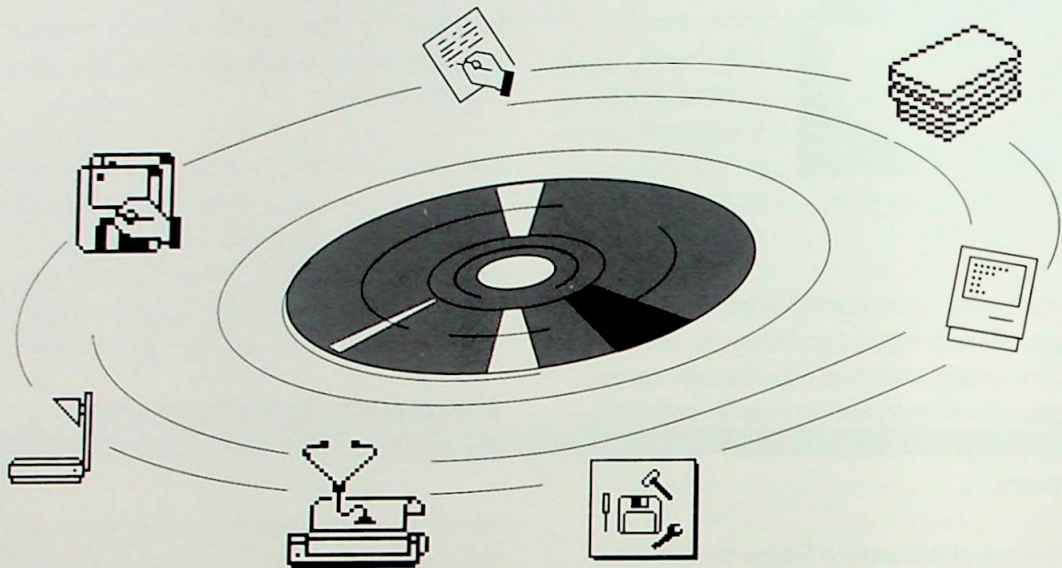
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## Product Details

The Technical Information Source is organized into these major categories:

- **Applications.** Apple and third-party applications, along with demonstration and Guided Tour files, allow you to emulate user problems with applications you may not have, and help you advise users on which solutions best meet their needs.
- **Copy Center.** Disk images of most of the 3.5-inch disks released by Apple allow you to replace users' disks quickly and easily. Included are current and historical versions of Macintosh, Apple IIGS, and Lisa® system software, peripheral drivers, Guided Tour disks, system utilities, and more.
- **Diagnostics.** Software and network-related diagnostics for troubleshooting users' problems include programs such as NodeCheck™, AppleTalk Peek, and AppleTalk Poke. (Hardware diagnostics used by service technicians are not included.)





- **Presentations.** Apple presentations on a variety of topics help you prepare technical presentations for your management and other departments in your organization. Topics include networking, connectivity, and A/UX, and come with building blocks, such as clip art.
- **References.** HyperCard stacks and other files that present a broad foundation of technical references help you prepare for future questions and direct you to other sources of information and support.
- **Technical Information.** A technical database provides answers to questions that have been asked by support providers like yourself. A HyperCard front end and search capabilities allow you to look quickly through more than 3,000 articles.
- **Training.** Self-paced training stacks on most Apple computers and peripherals help new users train themselves, freeing up your time for other support activities.
- **Utilities.** Frequently used system utilities include the Apple File Exchange, Font/DA Mover, and ResEdit™, centralized to help you find the program you need to solve a particular problem.
- **Additional Features.** On-line help and keyword search help you locate what you need, and a built-in feedback mechanism allows you to send in suggestions for design changes and content enhancements.



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## System Requirements

To use the Technical Information Source CD-ROM, you'll need the following:

- A Macintosh Plus or greater, with a minimum of 1 megabyte of memory (2 megabytes recommended)
- AppleCD SC drive

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## Ordering Information

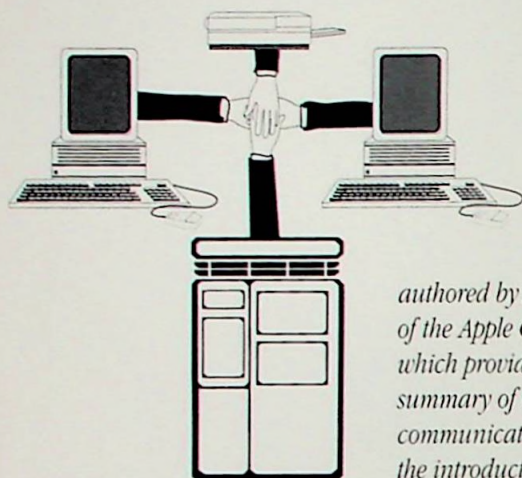
For a demonstration of the Technical Information Source, contact your local authorized Apple reseller or Apple representative, or pick up a copy of the April or May issue of *MacUser* magazine, in which you'll find an Apple ad that offers a free CD-ROM sampler of the Technical Information Source.

To purchase the Technical Information Source, see your authorized Apple reseller or your Apple representative.





# Introduction to Protocol Conversion



*The information in the article is taken from Understanding Computer Networks,*

*authored by Apple Computer and part of the Apple Communications Library, which provides a comprehensive summary of the Apple networking and communications environment from the introductory to the highly technical level. Published by Addison-Wesley,*

*the library is available at many computer stores and bookstores.*

Network protocols are the rules that network devices must follow to interact with one another successfully. A hierarchy of protocols governs communication; when two applications communicate, each has an underlying framework of controlling software that makes their dialogue possible. In any network architecture, protocols must exist that define three general classes of functions:

- Application services are the highest-level network functions. They enable an application program to communicate with an equivalent program on another computer.
- Transport services are lower-level network functions that manage addressing and other transmission control tasks.
- Connection services are the lowest-level network functions. These govern the actual, physical transmission from one computer's memory onto the network, and then into the destination computer.

To understand the kinds of behaviors prescribed by protocols, consider the things that a device on a

network might do while performing a typical task such as sending an electronic mail message.

User	Network Software
Starts the electronic mail program network	<ul style="list-style-type: none"><li>• Determines the address of the server</li><li>• Sends the server a request for a list of new messages</li><li>• Sends a list of messages from the server to the user's address</li></ul>
Types a new message	<ul style="list-style-type: none"><li>• Appends the destination to the message and enters the message destination</li></ul>
Sends the message	<p>The workstation sends the information to the server; the server translates the addressee's name into a network address. Then the software:</p> <ul style="list-style-type: none"><li>• Formats the message packets with sender and destination addresses</li><li>• Transmits the message through the network connection</li><li>• Ensures that the message arrives at the mail server device without error</li></ul>



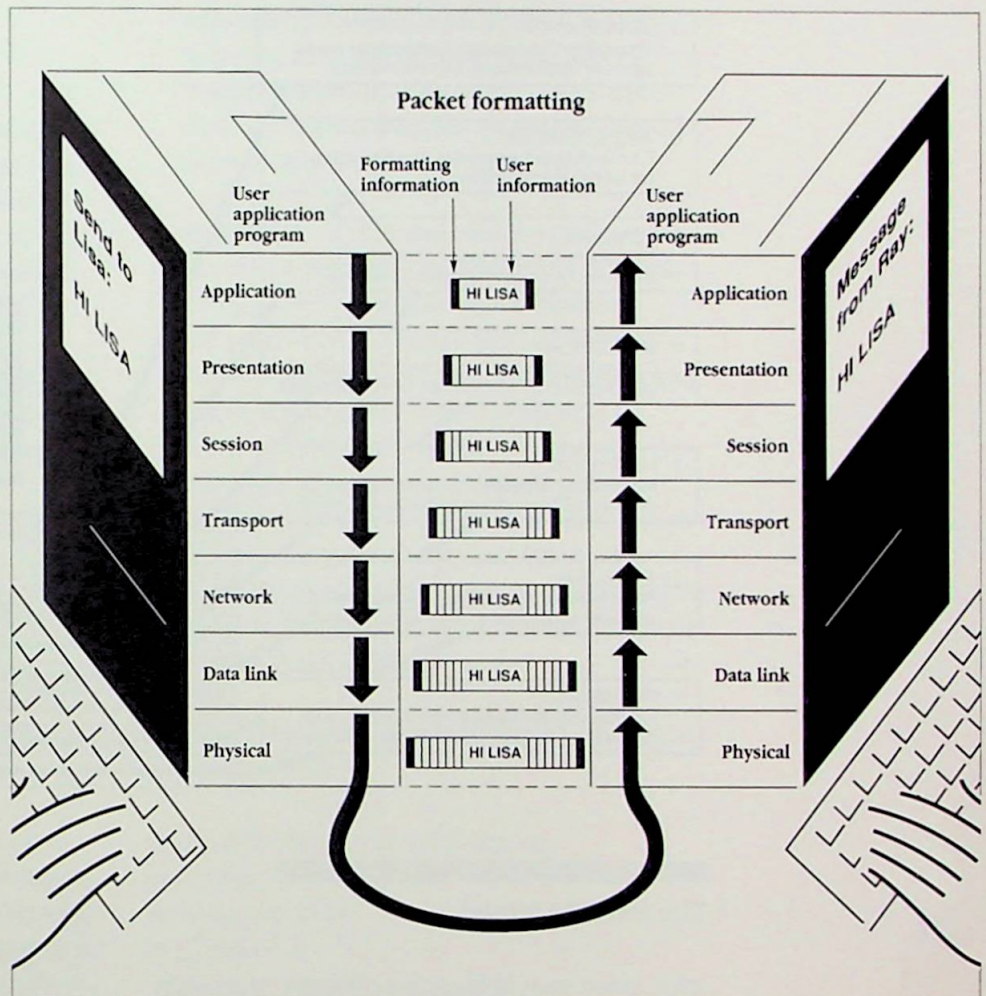
The preceding example includes some of the more visible activities governed by protocols. To perform each of these tasks, additional protocols are required to do the following things:

- Control access to the network
- Identify the user's address to the server
- Establish a communication session between the devices
- Make sure the information is transmitted in the appropriate format (see illustration at right).

Different protocols deal with tasks that occur at different levels of network operations: Some are concerned with acquiring commands from the user application, as in the example; others, with making sure the devices are aware of one another and responding properly; and still others, with controlling the connection to the network and moving data between devices.

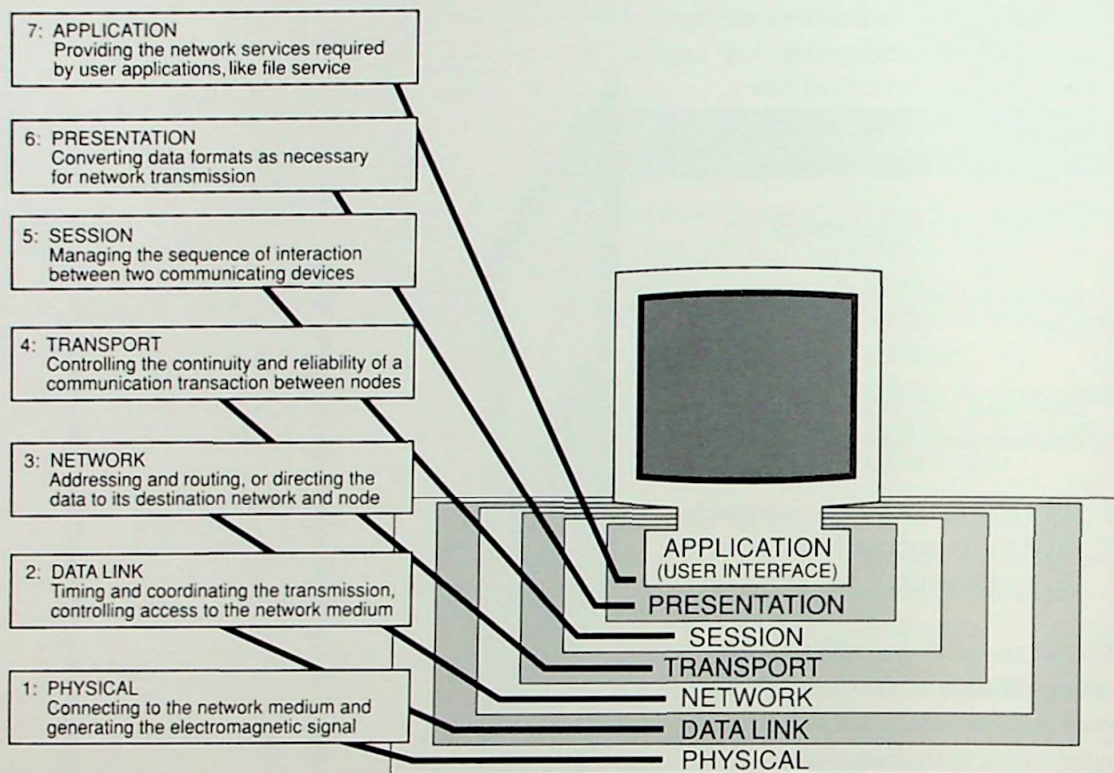
For this reason, network protocols are generally referred to in terms of the levels, or *layers*, of activity they perform. The International Standards Organization (ISO) has published a model for layered network protocols that has become widely used in describing and comparing different network protocol architectures.

The ISO model is called the Open Systems Interconnection (OSI) reference model. It is described here



briefly to illustrate how a hierarchy of network functions can be represented by separate layers of protocols. Note that the hierarchy ranges from the physical hardware functions of the network at its lowest layer up to the more user-oriented functions at the highest layer. (See the illustration on page 18.) These are also referred to as *low-level* and *high-level* functions.





### The ISO/OSI Model

Information moving from one computer to another begins at the highest layer in the conceptual hierarchy of protocols—the application layer—and moves through successively lower layers to the physical layer—where the actual transmission takes place—and then, in the receiving computer, moves from the physical layer back up to the application layer. (See the illustration above.)

What is actually taking place is that at each layer, there is a software module that implements certain network functions according to corresponding

protocol specifications. When sending data, a packet of information is passed along from one software module to another, and at each point acquires some additional formatting or addressing that is necessary for the packet to be transmitted through the network.

At the receiving end, the packet passes through the layers in the reverse order. At each stage, a software module corresponding to the module on the sending device reads the formatting information, strips it away, and passes the packet up to the next layer. The user information ultimately reaches the receiving application program in its original form.



## Connecting Networks

Four kinds of devices are used to connect computer networks: repeaters, bridges, routers, and gateways. These connection devices can best be described in terms of the hierarchy of network functions, as they perform functions that may involve one or more of the protocol layers.

- **Repeaters:** A repeater is used when a network cable needs to be extended beyond its recommended maximum length or maximum number of devices. A signal weakens as it travels through the network cable. The repeater amplifies and retransmits the signal. The repeater can extend the distance covered by a network cable and thereby increase the physical limit to the number of devices that can be connected. For example, adding a repeater to a network with a cable limit of 1,000 feet might increase that limit to 2,000 feet.
- **Bridges:** A bridge's functions involve the first and second layers of network protocols. Using data link protocols, the bridge can read the node address attached to a packet and selectively filter out or transmit the packet depending on its destination. Networks connected by a bridge remain physically separate entities, governed by their own limits and capacities, but to devices on the rest of the internet they appear as one network.
- **Routers:** A router is used in internets where more selective decision-making intelligence is required at the point of connection. The router allows connected networks to remain fully independent and to retain separate identities and addresses. The router is aware of the other networks and routers in the internet and can select the most efficient path to the data's intended destination. This ensures faster traffic flow and can automatically provide for detours if a connection is broken along the path.
- **Gateways:** Of all connection devices, gateways use the greatest range of networking protocols because they serve as translators between different kinds of network protocol architectures. A gateway is not necessarily used to make a network larger; its primary purpose is to overcome differences between connected networks. The gateway interprets network-related information in a data transmission, such as addressing and routing instructions, then translates these and the message content into the format of the other protocol, and retransmits the data onto that network.

For more information about the Apple Communications Library, contact:

Addison-Wesley Publishing Company  
Jacob Way  
Reading, MA 01867  
(617) 944-3700



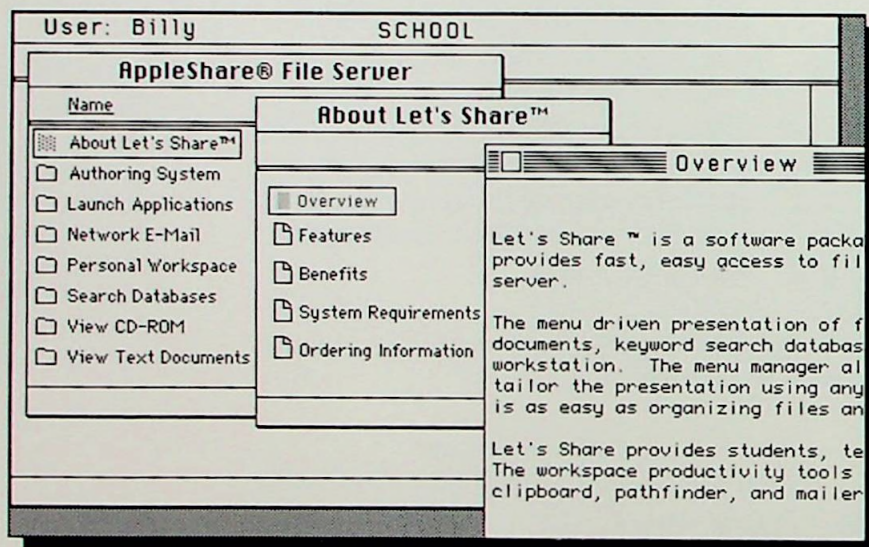


## Let's Share Menu Management Software

Let's Share, from Russ Systems, is software that provides access to files and folders stored on an AppleShare file server. Designed specifically for schools, the menu-driven presentation of files and folders allows students to access text documents and databases, and to launch applications from any Apple II workstation. Let's Share also provides features for managing and organizing Apple II activities on the network; teachers or network administrators can customize presentation of activities.

The application sets up and provides access to "personal workspaces" on the server, which are then maintained by individual users with workspace productivity tools that include an editor, clipboard, filer, and mailer for network electronic mail (e-mail). The menu presentation allows students to use individual files and folders without entering ProDOS pathnames or BASIC commands. Teachers and network administrators can address

individual student or group activities and tailor menus at any time, from any workstation.



Students, teachers, and staff can copy, send, and receive documents from their personal workspaces using the e-mail features of the program, which allow private communications as well as "public" posting. It's even possible to set up an opening screen to be seen by all students when they sit down at the computer.

Let's Share also includes a courseware authoring system, which lets teachers personalize courseware, tutorials, and exams, and simplifies updating of school activities in the lab, classroom, library, or

office. Teachers can record task times and document results, take surveys, and collect enrollment data. They can also build databases that use a single set of search and retrieve rules to work with data from Apple II, Macintosh, MS-DOS, and mainframe environments. The authoring system supports privacy features that allow users to control access to folders stored on the file server. Other features of the authoring system include the following:

- Prompts for true/false, multiple-choice, and essay quizzes
- Branches to multiple files and applications
- Date and time stamps for student activities



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## System Requirements

To use Let's Share, you'll need an AppleShare file server and either an Apple IIe personal computer (with 128K of memory, an Apple IIe Workstation Card, and a LocalTalk Connector Kit) or an Apple IIGS personal computer (with AppleShare IIGS Workstation Software and a LocalTalk Connector Kit). Menu management can be done from an Apple II or Macintosh workstation.

For further information about Let's Share, contact:

Russ Systems  
1344 Pacific Avenue, Suite 103  
Santa Cruz, CA 95060  
(408) 476-8050  
AppleLink: D1929

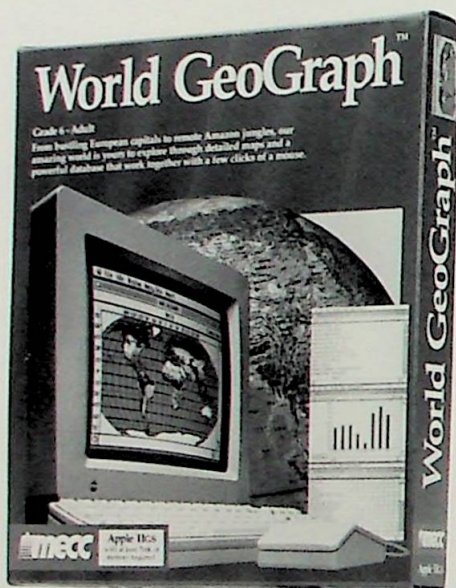




## MECC Products for Education

MECC is a software publisher and education service organization that started in 1973. With more than 200 software titles in subjects from math to language skills, MECC believes it has the largest educational software base in the country. Focusing on learning software for students from preschool to college age, MECC also conducts training workshops for educators and provides research through the MECC/University of Minnesota Center for the Study of Educational Technology.

MECC products released in the last two years include the following.



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### World GeoGraph

World GeoGraph, for students in grade 6 to adults, uses the memory and graphics capabilities of the Apple IIGS to create an environment for studying world geography. Designed as an exploratory tool, the package includes a 55-category database, detailed screen maps, and graphing features, which encourage a hands-on approach to study. Students can explore the world through maps or through the information database, and all maps interact with the database. In other words, when students use the database to make comparisons among nations, those comparisons will also be visible on the maps, and vice versa. All information can also be displayed in graph and table form.

Teachers can print out any of the maps, databases, charts, or graphs and use them as classroom handouts. The package includes a complete collection of lesson plans, textbook and curriculum correlations, and student reference materials.

World GeoGraph runs on an Apple IIGS computer with at least 768K of memory, a color monitor, and at least one 3.5-inch floppy disk drive.

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### USA GeoGraph

Based on the same concepts introduced in World GeoGraph, this product links a set of more than 30 maps with a database of over 80 information categories. Students can study information on a single state, or they can interpret national patterns with interactive maps showing data distribution. They learn basic facts about



the United States, including geographic locations and information about the people who live there. Teachers can customize the program by creating default settings and adding up to three extra database categories of their own.

USA GeoGraph also requires an Apple IIGS with at least 768K of memory, a color monitor, and at least one 3.5-inch floppy disk drive.

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### **Time Navigator**

Time Navigator is a social studies package designed for students in grade 7 to adults. A time-travel simulation, it's intended to help students learn about twentieth-century American history and culture. The program focuses on sequencing—that is, placing historical events, persons, or artifacts in their correct chronological order. For example, although it is important for students to know that the Great Depression began in 1929, it's even more important for them to know that it occurred *after* World War I and *before* World War II.

Students go back into the past and have the task of maneuvering their way toward the present by selecting headlines, conversations, books, songs, movies, or artifacts they believe to be from the most recent year. If they select correctly, they move forward in time.

Time Navigator includes management options that allow teachers or parents to modify program presentation or content to conform to student or classroom needs. For example, you can adjust the range of years covered by the simulation and restrict topic categories.

The program runs on any Apple II with at least 128K of memory, at least one floppy disk drive, and a monochrome or color monitor. Disks are available in either 5.25-inch or 3.5-inch format.

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### **Iris**

Iris is an on-line telecommunications network for educators and students. Offered by MECC in partnership with Metasystems Design Group of Arlington, Virginia, the service is named after the Greek goddess of rainbows, who served as personal messenger to Zeus. It features electronic mail capabilities, as well as educational services.

Iris is used for student projects that span classrooms around the country. It offers a full schedule of on-line, structured language arts, social studies, and math/science projects for all grade levels throughout the school year. The system provides a way for teachers to communicate with their peers by joining on-line discussion



and information forums. A special area of the network is devoted to technical support for all kinds of educational technology, including computer equipment, application software, computer languages, and various emerging technologies.

The teacher forums and student projects are designed and operated by Iris moderators, who are teachers with experience in the use of telecommunications networks. The system is available 24 hours a day, 365 days a year, and provides a toll-free help line during business hours. Every subscriber is assigned an on-line host, a teacher familiar with Iris who helps users become part of the on-line community, find areas of interest, and get answers to technical questions. Subscribers also receive a newsletter that summarizes current and upcoming on-line activities.

Connection to the network is made via a local phone call to Telenet or via an Iris toll-free number. Equipment requirements include a personal computer, any general-purpose telecommunications software package, and a modem.

For further information about these and other MECC products, contact:

MECC  
3490 Lexington Avenue North  
St. Paul, MN 55126  
1-800-228-3504 or (612) 481-3500





## Inside AppleTalk: Network Q&A

*This article contains questions and answers based on material from Inside AppleTalk (March 1989 edition; ISBN 0-201-19257-8), published by Addison-Wesley and available from APDA.*

**Q:** *Inside AppleTalk* suggests that a protocol stack, such as AppleTalk for VMS™ or AppleShare PC, is an implementation of a protocol suite. Most other literature refers to a protocol stack as a subset of the OSI (Open Systems Interconnections) model. An example is TCP/IP, which does not include layers 6 and 7. Which is more accurate—the implementation idea or the subset idea?

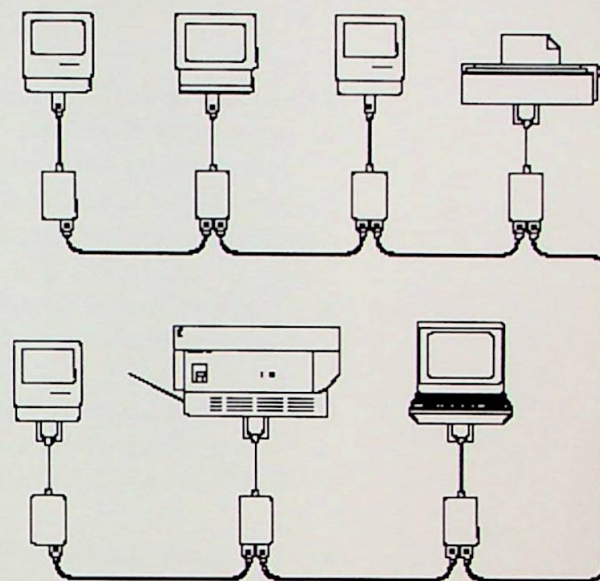
**A:** Protocol stacks (such as AppleTalk for VMS) are an implementation of a defined set of protocols (a protocol suite) such as AppleTalk. In other words, a protocol stack such as AppleTalk for VMS implements the AppleTalk network architecture on a VAX.

TCP/IP was designed before the OSI seven-layer model was proposed, so it would be incorrect to state that it was designed as a subset of the OSI model. There are protocols that are layered on top of TCP/IP to provide higher-level functionality, such as file sharing and mail services.

**Q:** *Inside AppleTalk* states that the OSI model is a general description of protocol usage and not the protocols themselves. Yet page 1-22 of *Inside AppleTalk* cautions that AppleTalk is not necessarily compatible with forthcoming OSI protocols. What are these forthcoming protocols? What is OSI, if not a reference to follow for integration into heterogeneous networks? What protocols for OSI have already been established? Are these based on CCITT protocols like X.25 and X.400? Although we have protocols that match every layer of OSI, are we not only loosely tied to those layers?

**A:** The OSI seven-layer model has become a standard in the industry for describing network architectures. The model was originally designed as a blueprint for the OSI network protocols, which were and still are in the process of being implemented. Many of the lower layers have already been implemented, and there are even products available for the Macintosh that provide connectivity solutions to these protocols. The press has often described the OSI architecture as the replacement for TCP/IP.

Although we have a network architecture that fits nicely within the OSI model, AppleTalk cannot be considered an implementation of OSI any more than it can be considered an implementation of TCP/IP. We use the model because it provides a concise and elegant way to describe our network. We do not use the OSI architecture, because many of its layers remain undefined.





Q: I understand that CSMA (carrier sense multiple access) has at least two flavors: persistent and non-persistent. With persistent CSMA, a deferring sender grabs the channel as soon as it's released, contending with another sender who grabs the channel at the same time. Non-persistent CSMA inserts a random period of time to wait before attempting to grab the channel. Is this what we call CSMA/CA? Or is CA something different? Or is it non-persistent CSMA that includes handshaking?

A: The CA in CSMA/CA stands for "Collision Avoidance." Collision avoidance uses the random period of time you refer to before it contends for the channel.

Q: I understand that the 10-Mbps rate of Ethernet is used only under heavy loads and that its throughput does not come through at that rate. What does this mean? Are nodes communicating at 10 Mbps or not? Is Ethernet a broadband network?

A: "Throughput" is used to describe the actual rate of transfer achievable over a network. It's a relative measurement, similar in reliability to rates described in terms of MIPS or megaflops. Network throughput is often measured by copying large files across a network and calculating the amount of data transferred in a specified period. Throughput depends on the overhead of the protocols being used and the capability of the servers to transmit data to the client. The 10 Mbps specified for Ethernet refers to the maximum rate possible over coaxial cable under ideal conditions, and is never achieved in real-world situations.

Standard Ethernet coax is baseband cable, not broadband. These days, however, you can run Ethernet over many different media, including broadband cable, unshielded twisted-pair telephone wiring, T1 telephone circuits, satellite links, and leased lines. These media have different speeds and characteristics.

Q: Does "physical network" mean cable? Does a bridge create an internet? Are physical networks and segments synonymous?

A: The physical network, or layer, typically refers to the physical medium in use. This can be cable, twisted-pair wiring, and so on. A bridge does not create an internet; a router provides the necessary functionality that is at a level high enough to create an internet. (See "Introduction to Protocol Conversion," page 16.) A segment is a piece of cable or set of wiring that is part of a physical network.





## LocalTalk Q&A

Following are some questions and answers about LocalTalk networking.

Q: Why does LocalTalk use a shielded-pair wire?

A: To meet FCC Class B specifications for radiated emissions using RS-422-type signaling, it's necessary to use shielded cable. Such cable also reduces electro-magnetic interference (EMI) with the signal on the cable itself. It is important to meet both the FCC specification and the need for data integrity in a variety of network installation locations. The ground (shield) prevents excessive radio frequency interference (RFI), and a resistor/capacitor combination reduces ground currents while offering a low-impedance path for high-frequency noise, further reducing EMI/RFI. Telephone wiring is suitable for use in normal environments; in some cases, however, electrical interference may compromise the integrity of data on systems installed over telephone wires.

Q: Why is the LocalTalk network length limited to 1,000 feet?

A: The 32-node/1,000-foot limit is a recommendation related to the average traffic generated by the nodes and the physical transmission limitations of LocalTalk. With 32 LocalTalk connection modules attached to a network, there is a specific drop in the network signal level, based on the characteristic impedance of the cable, the impedance of the secondary transformer, and the distance over which the signal must travel. The recommended limits are based on the maximum signal level drop over the 1,000-foot distance with 32 nodes. More distance and/or more nodes could reduce the network signal below the acceptable data reliability limits, or below the acceptance range of the receiver chips in the system.

From a traffic standpoint, only active nodes affect performance. However, both active and nonactive workstations affect the electrical characteristics of the network, because each LocalTalk connector box (transformer-isolated) puts another load on the network, regardless of whether the workstation is on.

Q: What is the impedance of the LocalTalk cable? Termination is documented in *Inside AppleTalk* as a 100-ohm resistor, yet other information seems to indicate 78 ohms as the impedance of the cable. Isn't the terminator supposed to match the cable for minimal signal reflection?

A: The impedance of the LocalTalk cable is 78 ohms, and the termination resistor is 100 ohms. According to *Inside AppleTalk*, "A 100-ohm resistor is used, even though the characteristic impedance of the line is 78, because it gives adequate termination and minimizes resistive losses." In other words, if there is a one-to-one impedance match across the transformer, there will be maximum signal transfer through the transformer, which would reduce the signal level on the network side of the transformer. If there is too great a difference in the values of the terminator and the cable, there will also be signal losses on the node side of the transformer. Compromising on 100 ohms minimizes losses caused by either perfect impedance matching or gross mismatch.



Editor's Note: *Inside AppleTalk* is available from APDA (see "Overview: APDA," page 10). For membership and ordering information, contact:

APDA  
Apple Computer, Inc.  
20525 Mariani Avenue, M/S 33G  
Cupertino, CA 95014  
1-800-282-2732 (U.S.)  
800-637-0029 (Canada)  
(408) 562-3910 (other countries)  
TLX: 171-576

AppleLink: APDA  
CompuServe: 76666,2405  
MCI: Postrom  
GEnie: A.DEVELOPER3  
MacNet: APDA  
Fax: (408) 562-3971





## Installing GS/OS on Apple SCSI Hard Disk Drives

*Some of the following information was taken from Tech Tidbits, a publication of Technical Support East, Apple Computer, Inc.*

Correct installation of the GS/OS operating system on an Apple IIgs hard disk drive can eliminate many common problems with GS/OS. The following instructions include the procedures for both single- and dual-drive systems. They also include information about installing drivers and about initializing both ProDOS- and non-ProDOS-formatted hard disks.

### Equipment Requirements

To perform the installations outlined in this article, you must have the following equipment:

- An Apple IIgs personal computer with at least 512K of memory and mouse, keyboard, and monitor
- The Apple GS/OS operating system Version 5.0.2 (or greater)
- An Apple SCSI hard disk drive
- An Apple SCSI interface card
- An Apple 3.5-inch floppy disk drive (two 3.5-inch drives are recommended)
- Two blank 800K floppy disks

### Step I: Hardware Setup

Instructions for setting up the hardware are provided in the manuals that come with the hardware. Make sure you've done all of the following:

1. Installed the SCSI card in the Apple IIgs.\*

\* The slots of the Apple IIgs are assigned to a list of devices that are used by the IIgs. This limits the slots available for installation of new cards. Below is a list of slots and their default assignments as shipped from the factory:

Slot	Device
1	Printer port on back of the IIgs
2	Modem port on back of the IIgs
3	80-column display for text-based screens
4	Mouse port
5	Smart port, used for 3.5-inch disk drives
6	Disk port, used for 5.25-inch disk drives
7	Your card

The default assignments allow only Slot 7 for inserting an SCSI controller card. However, the configuration of a particular user's system may provide other slots for the SCSI controller card. Here are some considerations:

- If there are no 5.25-inch disk drives attached to the IIgs, Slot 6 would be available for the SCSI card.
- If there are no 3.5-inch disk drives attached to the IIgs, Slot 5 would be available for the SCSI card.
- If no printer is attached, Slot 1 could be used for the SCSI card.
- If no modem will be used on the IIgs, this leaves Slot 2 available for the SCSI card.

In any of the above instances, be sure to change the Control Panel Slots assignment so that the slot containing the SCSI card displays Your Card. Once GS/OS is installed onto the SCSI hard disk, be sure the Control Panel Slots Startup item is set to the slot containing your SCSI card.



2. Connected the SCSI hard disk drive to the interface card.
3. Connected the Apple 3.5-inch disk drive(s).
4. Connected the monitor, keyboard, and mouse.
5. Checked the Control Panel settings. The slot that contains the SCSI card should be set to "Your Card," and the Apple IIgs should start up from Slot 5.

Note that SCSI ID numbers are 0 to 7, inclusive—and no two SCSI devices can have the same ID number. When you connect the Apple SCSI interface card to the hard disk, you must place the SCSI jumper on the pins under the number 9, giving the computer an SCSI ID of 7.

---

## Step II: Software Setup

The two floppy disks that come with GS/OS are your master disks; you'll need a backup copy of each of them before you begin the installation process. Following are the disks and manuals that come with your software package:

- Apple IIgs System Disk
- Apple IIgs System Tools disk
- *Apple IIgs System Disk User's Guide*
- *Apple IIgs System Tools* manual

When you make the backup disks, give each of them a temporary name. (GS/OS does not allow two disks with the same name to be on the desktop at the same time.) After the backups are made, restart the IIgs with the backup disks and rename them; the Installer requires that the system disk be named SYSTEM.DISK and that the tools disk be named SYSTEM.TOOLS.

## Driver Installation

GS/OS uses software drivers to support peripherals such as 3.5-inch disk drives and hard disk drives. Before proceeding to the installation of GS/OS, you must install the SCSI Hard Disk driver on the backup copy of SYSTEM.DISK.

To install the driver using a system with one 3.5-inch floppy disk drive, follow these steps:

1. Without turning on the hard disk drive, insert the SYSTEM.DISK into the 3.5-inch drive.



2. Turn on the IIGS.
3. You'll see the message, "Welcome to the IIGS." When an icon of the SYSTEM.DISK appears on the desktop, eject the SYSTEM.DISK, using the eject button on the front of the 3.5-inch disk drive, and insert the SYSTEM.TOOLS disk. An icon of the SYSTEM.TOOLS disk appears on the desktop.
4. Open the SYSTEM.TOOLS disk and run the Installer program.
5. At the top left of the window, there will be a line of text that says, "Disk to Update: SYSTEM.DISK." (If Disk to Update says SYSTEM.TOOLS instead of SYSTEM.DISK, eject the TOOLS disk and insert the SYSTEM.DISK.)
6. Click the disk button in the bottom right of the window.
7. You'll see SYSTEM.DISK listed after Disk to Update, and a list of drivers, applications, desk accessories, updates, and system configurations will appear on the left side of the window. Scroll through the list until you see SCSI Hard Disk and select it by clicking it once.
8. Click Install.
9. You'll see a dialog box indicating that files are being read and written. Then the Installer window reappears. Quit the Installer program.
10. Shut down the IIGS by choosing Shut Down from the Special menu.
11. You'll see a dialog box with several selections. Select "Turn off system power."
12. When you see the message, "You may now switch off your Apple IIGS safely," turn off the computer.

To install the driver using a system with two 3.5-inch disk drives, insert SYSTEM.DISK into Drive 1 and SYSTEM.TOOLS into Drive 2. You won't have to swap disks; all other screens, dialog boxes, and commands are the same as those described in the preceding instructions.

---

### **Step III: Hard Disk Initialization**

The following instructions are for systems that have ProDOS-formatted hard disk drives, non-ProDOS-formatted hard disks, or new (unformatted) hard disks with one or two 3.5-inch drives.



Note that hard disk drives larger than 32 megabytes that will be used with a combination of ProDOS 8 and GS/OS must be partitioned. ProDOS 8 supports only 32 megabytes of hard disk space. Partitioning is explained in the *Apple IIgs System Tools* manual (page 17). After you partition the hard disk, follow the installation instructions for GS/OS (Step IV, page 33).

#### **A. ProDOS Hard Disk Preparation Using One 3.5-inch Disk Drive**

Follow these steps to format a ProDOS hard disk using a system with one 3.5-inch floppy disk drive:

1. Turn on the monitor.
2. Turn on the hard disk drive and wait until it's ready.
3. Insert SYSTEM.DISK into the 3.5-inch drive.
4. Turn on the Apple IIgs.
5. "Welcome to the IIgs" appears on the screen. When the icons for SYSTEM.DISK and the hard disk appear on the desktop, use the mouse to select the hard disk icon.
6. Choose Initialize from the Disk menu.
7. A dialog box asks you to name the hard disk. Because the hard disk is already formatted with ProDOS, it has a name. If the existing name is okay, click Continue. If you want a new name, type it in and click Continue. (The new name cannot exceed 15 characters.)
8. Another dialog box appears, with ProDOS highlighted in the left column and 20MB highlighted in the right column. Click Initialize in the dialog box.

When the "Initializing" dialog box disappears, the hard disk drive initialization is complete; icons for the SYSTEM.DISK and the hard disk appear on the screen.

Proceed to Step IV, page 33.

#### **B. ProDOS Hard Disk Initialization Using Two 3.5-inch Disk Drives**

To format a ProDOS hard disk using a system with two 3.5-inch floppy disk drives, insert SYSTEM.DISK in Drive 1 and SYSTEM.TOOLS in Drive 2 before turning on the Apple IIgs. Follow the steps listed in the preceding section. Then proceed to Step IV, page 33.



### C. Non-ProDOS Hard Disk Initialization Using One 3.5-inch Disk Drive

Follow these steps to format a non-ProDOS hard disk on a system with one 3.5-inch floppy disk drive:

1. Turn on the monitor.
2. Turn on the hard disk drive and wait until it's ready.
3. Insert SYSTEM.DISK into the 3.5-inch drive.
4. Turn on the Apple IIGS.
5. "Welcome to the IIGS" appears on the screen. The SYSTEM.DISK icon then appears on the desktop. A dialog box appears with the following message:

GS/OS does not recognize the file system on this disk (in device XXXXX).  
Do you want to initialize it?

You're also prompted to type in a name for the hard disk. Type in a name of 15 characters or fewer and click Initialize.

6. A second dialog box appears, with ProDOS highlighted in the left column and 20MB highlighted in the right column. Click Initialize.

An "Initializing" dialog box appears; when it disappears, the hard disk initialization is complete. Icons for both the SYSTEM.DISK and the hard disk appear on the screen. Proceed to Step IV, below.

### D. Non-ProDOS Hard Disk Initialization Using Two 3.5-inch Disk Drives

To format a non-ProDOS hard disk using a system with two 3.5-inch floppy disk drives, insert the SYSTEM.DISK in Drive 1 and SYSTEM.TOOLS in Drive 2 before turning on the IIGS. Follow the steps as listed in the preceding section. Then proceed to Step IV, below.

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#### Step IV: Installing GS/OS on the Hard Disk

Follow these steps to install GS/OS on the hard disk:

1. Eject SYSTEM.DISK and insert SYSTEM.TOOLS. Open the SYSTEM.TOOLS disk and run Installer. The Installer window will appear.



2. Click the Disk button until the name of your hard disk appears in place of SYSTEM.DISK to the right of Disk to Update.
3. A list of items that may be installed will be displayed on the left side of the window. Using the mouse, scroll through the list until Latest System Files appears and select it by clicking.
4. Click Install.
5. A dialog box indicates that files are being read and written. Then the Installer window reappears. Select SCSI Hard Disk and click Install. If you need other drivers, install them now in the same way.
6. After installing the drivers, quit the Installer program.
7. When you are returned to the desktop, shut down the IIGS by choosing Shut Down from the Special menu. A dialog box appears with several options. Select "Turn off system power."
8. When you see a message that it is safe to turn off the computer, turn it off.
9. Turn on the computer without inserting any floppy disks. "Welcome to the IIGS" appears on the screen, indicating that the computer is starting up from the hard disk and that GS/OS has been successfully installed.

Following these procedures exactly should clear up any GS/OS installation difficulties. Before you install applications, be sure to check with the publisher of your software to make sure it works with the GS/OS operating system.





# Installing ProDOS 8 on Apple SCSI Hard Disk Drives

*The following article was written by Bill Starnes for Tech Tidbits, a publication of Tech Support East, Apple Computer, Inc.*

You can minimize floppy disk management by using your hard disk drive as your startup drive and loading your applications on it. Following are instructions for installing ProDOS 8 on your Apple II Plus or IIe hard disk drive.

---

### Equipment Requirements

- An Apple II Plus or IIe personal computer (ProDOS 8 is automatically installed when you install GS/OS on a hard disk drive for the IIGS. See "Installing GS/OS on Apple SCSI Hard Disk Drives," page 29.)
- Apple II System Utilities Version 3.0 or greater (5.25-inch or 3.5-inch format)
- A keyboard
- A monitor
- An Apple SCSI hard disk drive with terminator
- An Apple SCSI interface card
- An Apple 5.25-inch or 3.5-inch floppy disk drive

---

### Step I: Hardware Setup

Instructions for setting up the hardware are provided in the manuals that come with the hardware. Make sure you've done all of the following:

1. Installed the SCSI card in Slot 4 of the computer.
2. Connected the SCSI hard disk drive to the interface card.
3. Connected the 5.25-inch or 3.5-inch disk drive.
4. Connected the monitor.
5. Connected the keyboard and the mouse.

Note that when you connect the SCSI interface card to the hard disk, you must check the SCSI ID number on the hard disk. If it is not correct, you may have problems later on. Your hard disk manual explains how to set the SCSI ID number.



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## Step II: Hard Disk Initialization

Hard disk drives larger than 32 megabytes that will be used with ProDOS 8 must be partitioned, because ProDOS 8 supports only 32 megabytes of hard disk space. Note that ProDOS 8 recognizes a maximum of two partitions; a hard disk drive larger than 60 megabytes will not be fully utilized. Therefore, if you have an 80-megabyte hard disk drive, partition it into two volumes, each with 32 megabytes or less. The remaining 16 megabytes of disk space will not be recognized and are not usable by ProDOS. Once the disk drive is partitioned, ProDOS will see the two volumes as Drive 1 and Drive 2. (Although the System Utilities software does not differentiate between floppy disk drives and hard disk drives in the menu selections, it will correctly format and copy files to the hard disk.)

Partitioning is explained in the *System Tools* manual. After you partition the hard disk, you can proceed with the ProDOS installation instructions in Step III, page 38.

### A. Formatting Hard Disks with the 5.25-inch System Utilities Disk

1. Turn on the hard disk and wait until it is ready.
2. Insert the System Utilities disk in the floppy disk drive.
3. Turn on the computer.
4. When the Utilities menu appears, choose Format a Disk and press Return.
5. You'll see a screen asking, "Where is your disk?" Choose Slot and Drive and press Return.
6. Enter the number of the slot in which your SCSI interface card is installed.
7. Enter 1 for the slot where your disk drive is installed and press Return.
8. You'll see a choice of operating systems. Choose ProDOS and press Return.
9. Type in a name for the volume, such as /Data or /Mydisk. Press Return.
10. A dialog box appears with the message: "Insert the destination disk into Slot#, Drive 1." Press Return.
11. If the drive is currently a ProDOS-formatted volume, a dialog box asks if you want to destroy it. This is your last chance to stop before formatting the drive. If you want to continue, select Yes and press Return.



12. A message will appear to tell you when the formatting is finished.
13. If you have partitioned your hard disk, you will now need to format the second volume. Return to Step 4, page 36, and continue as before, except that when you are asked to enter the drive number, type 2.
14. After formatting the volumes, press Escape to return to the main menu, and go on to Step III, page 38.

#### **B. Formatting Hard Disks with the 3.5-inch System Utilities Disk**

1. Turn on the hard disk and wait until it is ready.
2. Insert the System Utilities disk in the floppy disk drive.
3. Turn on the computer.
4. Open the Sys.Utils file subdirectory and run the SYSUTIL.SYSTEM program.
5. When the Utilities menu appears, choose Format a Disk and press Return.
6. Enter the number of the slot in which your SCSI interface card is installed.
7. Enter 1 for the drive number and press Return.
8. You'll see a choice of operating systems. Choose ProDOS and press Return.
9. Type in a name for the volume, such as /Data or /Mydisk. Press Return.
10. A dialog box appears with the message, "Insert the destination disk into Slot #, Drive 1." Press Return.
11. If the drive is currently a ProDOS-formatted volume, a dialog box asks if you want to destroy it. This is your last chance to stop before formatting the drive. If you want to continue, select Yes and press Return.
12. A message will appear to tell you when the formatting is finished.
13. If you have partitioned your hard disk, you will now need to format the second volume. Begin with Step 5, above, except that when you are asked to enter the drive number, type 2.
14. After formatting the volumes, press Escape to return to the main menu, and go on to Step III, page 38.



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### Step III: Installing ProDOS on the Hard Disk

1. You should still be running the System Utilities program; if not, restart the system and run SYSUTIL.SYSTEM (see Step 4, page 37).
2. When the Utilities menu appears, Choose Copy Files and press Return.
3. A dialog box asks, "Where is the source Disk?" Select Slot and Drive, and press Return.
4. A dialog box asks you to enter the slot and drive numbers. Enter the slot number and the drive number in which the System Utilities disk is inserted. Make sure the drive number is set to 1, and press Return.
5. A dialog box asks, "Where is the destination Disk?"; select Slot and Drive, and press Return.
6. A dialog box asks you to enter the slot and drive numbers. Enter the slot number in which the SCSI interface card is installed. Make sure the drive number is set to 1, and press Return.
7. A dialog box asks you to select some or all files; select All and press Return.
8. All the files on the Utilities disk will be copied to the hard disk. This may take awhile. When all the files have been copied, press Return to return to the main menu.
9. Quit the System Utilities program.

ProDOS and the System Utilities have been loaded to the hard disk drive, and you can now assign the hard disk as the startup device. To do this, move the SCSI interface card to Slot 7. If you have trouble starting up from the hard disk, make sure that you have completed all the steps listed in these instructions.

With ProDOS installed and running, you can install your applications. However, before doing so, be sure to check with the publishers of your applications to make sure they will work with the ProDOS operating system. Following these procedures should clear up any ProDOS installation problems.





## Apple II Q&A

*The following questions and answers about Apple II computers were provided by Apple's technical support staff.*

Q: I have a 1.25MB Apple IIGS that crashes randomly. The problems seem to occur only with programs such as AppleWorks, which take advantage of all the memory in the machine.

A: Your Apple IIGS Memory Expansion card may be the source of the problem; specifically, you may have bad RAM chips or chips that don't meet Apple IIGS specifications. See your authorized Apple service provider.

Q: I just bought a Grappler+ parallel interface for my new printer. After setting it up using the instructions in the manual, I tried it with AppleWorks Version 2.1. The printer starts new lines where there shouldn't be new lines, making a mess of the output.

A: Change the interface card control code in AppleWorks; under Other Activities, choose "Specify info about your printer," and then Interface Cards. The default is Control-I80N; with the Grappler+, you must use Control-I0N.

Q: To set up classes using the Aristotle™ software, do I need any additional RAM in the Apple IIGS?

A: To set up classes with Aristotle and an Apple IIGS over an AppleShare network, you need at least 1MB of RAM to allow for the system, the application, and a 256K RAM disk. The original IIGS had 256K of RAM on the logic board. To bring the total memory up to at least 1MB, you need to purchase an Apple IIGS Memory Expansion Card, which will result in 1.25MB of total system RAM. (You must fully populate the memory card because it doesn't support the 768K configuration.) The new Apple IIGS, with 1MB of RAM built into the logic board, does not require an additional memory card for setting up classes with Aristotle.

Once you have sufficient system memory, set up the required RAM disk by selecting RAM Disk in the Control Panel and setting it to 256K. Then restart the computer, and you'll be able to set up Aristotle classes.





# Loading a ProDOS 8 Hard Disk: Background Information

*The following article is excerpted from "Polishing Your Hard Disk," Nibble magazine, January 1990, copyright 1990 MindCraft Publishing Corp.*

Taking the time to plan for loading of applications and data on your hard disk can improve disk performance. The following information can help you make decisions now that may save you time in the future.

---

### ProDOS Fundamentals

ProDOS divides all disk storage into 512-byte blocks. A 5.25-inch floppy disk holds 280 blocks, a 3.5-inch floppy disk holds 1,600, and a 20-megabyte hard disk drive holds more than 39,000. These blocks are software creations; they do not affect the way data is physically stored on the disk.

Each disk sector—the smallest section of storage on your disk—consists of 256 bytes; each block has two sectors. The smallest amount of space a disk file uses is one block, or 512 bytes, whether or not the data in the file fills 512 bytes.

Any formatted disk—whether a floppy disk or a hard disk—is considered to be one volume (unless the hard disk has been partitioned; then each partition is a volume).

ProDOS takes some disk space for its own use on your volume; blocks zero and one of track one contain the ProDOS boot code. Blocks two through five contain the most important part of the disk: the volume directory. This is a master index of what is where on the disk. Each block of the volume directory can contain 13 entries, for a total of 52. One entry is reserved for the volume name, so you can have only 51 file or subdirectory entries at the root level.

After you start loading the disk, you may get the message, "Disk Full." This is a common stumbling block for new users. The message should say, "Directory Full," because there may be room for more files, but you've reached the maximum number of directory entries. But ProDOS lets you get around this limitation by allowing you to create subdirectories—extensions of the volume directory that are not subject to the same restrictions. Subdirectories can be any size and can contain an unlimited number of files or additional subdirectories.

---

### The Software

The most important program you will install on a hard disk is a program selector, which provides a common entry and exit point for all applications on the disk. You launch applications from it and return to it when you quit an application. There are a variety of program selectors from which you can choose. Some are commercial programs, others are public domain; some are shareware, and others are free. Ideally, a program selector will let you launch any program on the hard disk at any time.



Some selectors do not have a predefined list of applications paths; you must choose a path to the program every time you use it. Others let you pick from a list of applications, as well as launch any program on the volume. This capability can be necessary when you have more applications than the selector list will allow.

Most program selectors do not work on the Apple IIgs if it's running GS/OS; however, the IIgs Finder™ performs the program selector function.

---

### Minimizing Fragmentation

When you save a file to disk, sequential blocks are filled. But as you use the disk system, you change and remove files (make them bigger or smaller), and add new files. If there is not enough free disk space for a file to be stored in sequential blocks, ProDOS breaks it into smaller groups of blocks that are not sequential. Files that were once contiguous become scattered, or fragmented, all over the disk. Although they still exist as complete files, their sectors may be widely separated. Such fragmentation increases access time. However, there's a simple procedure for loading a disk that minimizes fragmentation:

1. Establish subdirectories first, even if you are not sure what they will eventually contain. This puts the subdirectories on the disk next to the volume directory, reducing the search time when you are opening subdirectories to look for files.
2. Limit the number of subdirectory levels—that is, avoid subdirectories within subdirectories within subdirectories.
3. Files that seldom change—ProDOS, BASIC.SYSTEM, and others you use regularly, such as AppleWorks—should be the first files you place on the disk.
4. Related files—those with similar purposes—should reside together; copy them to your disk in sequence.

While these steps will reduce fragmentation and keep your system from slowing down prematurely, even the best-managed hard disk will eventually need to be optimized.

You'll want to get each file in contiguous sectors on the disk. The optimization process is easy but time consuming:

1. Copy all the files on the hard disk to floppy disks.
2. Format the hard disk, rewriting all sectors on all tracks.
3. Copy all the files back to the hard disk.

After optimization, keep your backup floppy disks and update them regularly; if the hard disk fails or needs to be replaced, your data and applications will be ready.





# Apple's One-Year Limited Warranty and Special Customer Service Promotion

Apple Computer, Inc. has announced that all Apple hardware products sold in the United States after January 1, 1990, will be covered by a one-year limited warranty.

The limited warranty provides coverage around the world for U.S. customers, who can obtain warranty service from any authorized Apple reseller in more than 80 countries worldwide. Previously, the U.S. warranty covered a 90-day period, and warranty service was available only from U.S. resellers.

In the United States, customers who require hardware repairs during the first 12 months of ownership simply take the system to any authorized Apple service provider and present proof of purchase. Their Apple hardware will be serviced at no charge. For warranty repairs on products purchased in the United States but serviced elsewhere, customers are required to pay the authorized Apple service provider for the repairs and then must file a claim for reimbursement from Apple USA.

The company also announced that customers who purchased Apple hardware products in the United States before January 1, 1990, are eligible for a special price on AppleCare®, Apple's extended service plan for out-of-warranty products (see the article "AppleCare: How to Take Care of Your Computer," page 43). AppleCare is available through authorized Apple resellers in the United States and covers replacement parts and labor. All Apple systems made since 1978 and purchased in the United States can qualify for this special promotion.

The AppleCare promotion, which is available from March 19 through May 31, 1990, offers an additional six months of free coverage when six months are purchased. For example, the promotional price for one year of AppleCare for an Apple IIe computer with color monitor and ImageWriter II printer is \$90; for a Macintosh SE computer with an internal 20-megabyte hard disk, the price is \$162; and for a Macintosh IIfx with an internal 40-megabyte hard disk and a color monitor, the price is \$246. Volume discounts of up to 25 percent are available depending on the number of Apple products covered.





# AppleCare: How to Take Care of Your Computer

AppleCare is Apple's extended service plan for out-of-warranty products. Your Apple equipment is among the most reliable in the computer industry. It has been designed, tested, and manufactured to give you years of trouble-free computing. But, like any other equipment, your Apple system requires care and maintenance to continue working in top form. We suggest the following basic tips:

1. Give your computer plenty of space.
2. Make sure you only have one System folder installed.
3. Lock disks to prevent viruses.
4. Don't label disks with pencil.
5. Limit the number of times you turn your system on and off during the day.
6. Clean your mouse every month.

## 7. Get AppleCare.

AppleCare may be purchased not only for your computer, but for any or all of your other Apple equipment, too. If your Apple equipment should need repair, just take it to any authorized Apple reseller, where it will be repaired at no extra charge.

AppleCare covers the cost of remedial maintenance and repair—including replacement parts and labor. What's more, if you purchase coverage for a minimum of five like items, you are eligible for discounts on AppleCare—ask your reseller for details.

There's no limit to the number of times your Apple equipment can be repaired when you're covered by AppleCare. Because you purchase AppleCare by the month, you can get as little or as much coverage as you need—up to 36 months. Which means AppleCare protects you against future increases in the cost of repairs. And unlike most other service agreements, which require purchase within a stated period of time, AppleCare lets you start your coverage at any time.

AppleCare is honored by nearly 2,000 authorized Apple resellers nationwide. So if you move to another city or state, your AppleCare agreement moves with you. What's more, if you sell your Apple system during the term of your agreement, your AppleCare coverage transfers to the new owner.



If you sign up for AppleCare while your equipment is still covered by Apple's limited warranty, you will be covered the instant that warranty expires. If your warranty or current AppleCare agreement has expired, just take your Apple equipment to any authorized Apple reseller to have it inspected. Once your equipment receives a clean bill of health, your AppleCare coverage can begin—even before you leave the store.

AppleCare is available through authorized Apple resellers in the United States (See "Apple's One-Year Limited Warranty and Special Customer Service Promotion," page 42, for information on a special AppleCare price.)



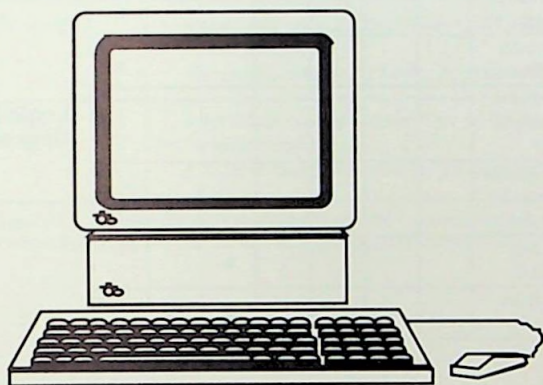


# Current Apple II Operating Software and Product Upgrades

Thanks to the AppleGram™ staff for developing the following charts, which contain information about:

- The version of operating system software recommended for each of Apple's hardware products
- Current upgrade options available from Apple

For additional information about upgrades and updates, see page 48.



## APPLE II OPERATING SOFTWARE

	Current Version Date Released	
System Disk (Apple IIe, Apple IIc)	3.1	4/2/88
System Disk (Apple IIgs)	5.0.2	7/15/89
System Tools Disk (Apple IIgs)	5.0.2	7/15/89
Applesoft BASIC		
ProDOS Applesoft Sampler	1.2	3/5/85
ProDOS BASIC Programmer's Examples	1.1	10/26/84
ProDOS Applesoft Command Interpreter (BASIC.SYSTEM)	1.4	7/31/89
Getting Down to BASIC IIe	1.1	6/12/86
ProDOS Applesoft Programmer's Asst. (APA)	1.4	6/28/84
ProDOS 8	1.8	6/14/89
ProDOS 16	1.3	6/29/87
Apple IIgs BASIC	1.0B4	9/15/87

## APPLE II UPGRADES

	Apple IIc	Apple IIc Plus	Apple IIe (unenhanced)	Apple IIe (enhanced)	Apple IIgs	
Apple IIc Memory Expansion Kit	•					Memory Expansion
Apple II 256K Mem. Exp. Kit	•		•	•	•	
Apple IIe Mem. Exp. Card			•	•		
Apple IIgs Mem. Exp. Card					•	
Apple IIe Enhancement Kit			•			Logic Board Upgrades
Apple IIgs Enhancement Kit			•	•		
Apple 5.25-inch Floppy Disk Drive	•	•	•	•	•	Drives
Apple 3.5-inch Floppy Disk Drive		•			•	
UniDisk® 3.5-inch Floppy Disk Drive	•	•	•	•	•	
Apple External 20SC Hard Disk				•	•	
Apple External 40SC Hard Disk				•	•	
Apple External 80SC Hard Disk				•	•	Cards
Apple External 160SC Hard Disk				•	•	
AppleCD SC (CD-ROM Drive)				•	•	
Apple II High-Speed SCSI Card (for Apple IIgs and IIe)				•	•	
Apple II SCSI Card				•	•	
Super Serial Card			•	•	•	Modems
AppleTalk Workstation Card			•	•		
Extended 80-Column Text Card			•			
Apple II Video Overlay Card				•	•	
Apple Modem (1200 bps)	•	•	•	•	•	
Apple Modem (2400 bps)	•	•	•	•	•	

\*This option requires the addition of the appropriate memory expansion card.



## MONITORS

	Apple IIe	Apple IIc Plus	Apple IIgs
Apple Monochrome Monitor IIe	•		
AppleColor™ Composite Monitor IIe	•		
Apple Monochrome Monitor		•	•
AppleColor Composite Monitor		•	•
AppleColor RGB Monitor			•
Apple II Monitor Stand		•	•

## PRINTER UPGRADES

	ImageWriter II	ImageWriter IQ	LaserWriter	LaserWriter Plus	LaserWriter IIsc	LaserWriter IIxt	LaserWriter IIxtx	
ImageWriter 32K Memory Option (Apple II only)	•	•						Memory Expansion
LaserWriter IIxtx 1MB Mem. Exp. Kit							•	
LaserWriter IIxtx 4MB Mem. Exp. Kit							•	
LaserWriter Plus Kit (ROM Upgrade for LaserWriter)			•					Logic Board Upgrades
LaserWriter Plus Kit (ROM Upgrade for LaserWriter Plus)				•				
LaserWriter IIxt Controller Card					•			
LaserWriter IIxtx Controller Card					•	•		

## NETWORKING & COMMUNICATIONS SOFTWARE

Access II	• Version 1.3.1
AppleShare	• AppleShare Print Server v. 2.0.1 • AppleShare File Server v. 2.0.1 • Apple II Setup Disk v. 2.1
Apple File Exchange	• Version 1.1.2
Aristotle	• Version 1.0

## MISCELLANEOUS PERIPHERAL OPERATING SOFTWARE

AppleCD SC	• Macintosh CD Setup Version 2.0.1 • Apple II CD Setup Version 1.0 • Apple IIgs CD Version 1.1
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## PRINTER SOFTWARE

LaserWriter	<ul style="list-style-type: none"> <li>• Laser Prep 5.2</li> <li>• LaserWriter Driver 5.2*</li> </ul>	<ul style="list-style-type: none"> <li>• IIGS LaserWriter Driver 3.0</li> </ul>
LaserWriter Plus	<ul style="list-style-type: none"> <li>• Laser Prep 5.2</li> <li>• LaserWriter Driver 5.2*</li> </ul>	<ul style="list-style-type: none"> <li>• IIGS LaserWriter Driver 3.0</li> </ul>
LaserWriter IIsc	<ul style="list-style-type: none"> <li>• LaserWriter IIsc Driver 1.1</li> </ul>	
ImageWriter	<ul style="list-style-type: none"> <li>• ImageWriter 2.7 (for direct-connect printers)</li> </ul>	
ImageWriter II	<ul style="list-style-type: none"> <li>• AppleTalk Apple IIGS ImageWriter 3.0 (for AppleTalk-connected printers)</li> <li>• Apple IIGS ImageWriter 3.0 (for direct-connect printers)</li> </ul>	<ul style="list-style-type: none"> <li>• AppleTalk ImageWriter 2.7 (for AppleTalk-connected printers)</li> <li>• ImageWriter 2.7 (for direct-connect printers)</li> </ul>
ImageWriter LQ	<ul style="list-style-type: none"> <li>• AppleTalk Apple IIGS ImageWriter 3.0 (for AppleTalk-connected printers)</li> <li>• Apple IIGS ImageWriter 3.0 (for direct-connect printers)</li> </ul>	<ul style="list-style-type: none"> <li>• LQ AppleTalk ImageWriter 2.0 (for AppleTalk-connected printers)</li> <li>• LQ ImageWriter 2.0 (for direct-connect printers)</li> </ul>

\* LaserWriter 6.0 is available for support of color PostScript® printers, and will improve halftone printing on monochrome PostScript devices. Contact an authorized Apple reseller for details.

Many hardware upgrades have configuration prerequisites, and require installation by an authorized Apple service provider.

For complete information regarding any Apple upgrades or updates, contact your authorized Apple reseller or an Apple sales representative. For the location of the reseller nearest you, call 1-800-538-9696.



# Current Apple Upgrades and Updates

An **upgrade** enhances features of existing hardware or software. Generally, an upgrade involves a fee, and any additional Apple hardware must be installed by an authorized Apple service provider.

A software **update** consists of enhancements, fixes, or patches to software. An update to Apple software is handled through an authorized Apple dealer or your Apple sales representative.

Following is a summary of the Apple upgrades and updates currently available for Apple II products.

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## Apple II High-Speed SCSI Card

This card replaces the existing Apple II SCSI Card. See "Apple II High-Speed SCSI Card," page 2, for more information. Order number A0220LL/A.

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## Apple IIe to Apple IIGS Upgrade

Your authorized Apple service provider can install a new logic board to upgrade the Apple IIe to an Apple IIGS.

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## Apple IIe to Enhanced IIe Upgrade (Apple IIe Enhancement Kit)

Your authorized Apple service provider can install the chips required to enhance the Apple IIe.

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## ProDOS Version 1.7

ProDOS Version 1.7 solves the problem that occurred with recognition of 1988 dates when third-party RAM cards were installed.

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## AppleWorks

For information about upgrades for AppleWorks, please contact:

Claris Corporation  
P.O. Box 526  
Santa Clara, CA 95052  
1-800-544-8554

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## Apple IIGS System Software Version 5.0.2

Apple IIGS System Software Version 5.0.2 corrects several problems discovered in the recently released System Software Version 5.0. The changes affect these disks: System.Disk, System.Tools, and AppleShare File Server Apple II Setup Disk.

All customers who purchased System Software Version 5.0 are entitled to a free upgrade to Version 5.0.2. Coupons for the software update are available from your Apple dealer or sales representative. An electronic version of the coupon is posted on the AppleLink network under the Apple Programs icon in the Upgrade and Update Programs folder.

The Apple IIGS System Software is available as a stand-alone product (order number A0013LL/A) and as part of an Apple IIGS CPU product (order number A0012LL/A).





## **Apple II Technical Bulletin**

Managing Editor: Armi Costello

Writer: Jennifer Woodul

Editor: Teri Thomas

Copy Editor: Van Goode

Production Manager: Susan Moore

Contributors: Steve Beck, John Love, Bill Starnes,  
Harvey Barnett, Doug Fowler

Special thanks to Apple's Technical Communication group and Technical Information Services group for their written contributions and technical expertise.

If you have any comments or suggestions,  
please contact:

Technical Bulletins

Apple Computer, Inc.

900 West Hamilton Avenue, M/S 72L

Campbell, CA 95008

AppleLink: TECHBULLETIN



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The *Apple II Technical Bulletin* provides users with current technical information about Apple products. Featured topics may be under consideration, and new product versions may be under development. Therefore, it's appropriate to consider this publication as a bulletin that is correct at the date of publication, rather than as a long-term reference source.

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Apple Technical Bulletins are also available as part of the Apple Software Update Program. For more information, contact your authorized Apple reseller or Apple sales representative.





**Apple Computer, Inc.**

20525 Mariani Avenue  
Cupertino, California 95014  
(408) 996-1010  
TLX 171-576